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ABSTRACT

From a population of 130 boys between 7 and 14 years of age who had been clinically diagnosed as aggressive, hyperactive, or withdrawn, 32, 31, and 32 Ss, respectively, were randomly selected and administered the Quay Behavior Problem Checklist and the Devereux Elementary School Behavior Rating Scale during the 1971-1972 academic year. A descriptive intercorrelation matrix was generated for the 4 Quay scales and the 14 Devereux scales. Three stepwise discriminant analyses were run: Quay scales only, Devereux scales only, and Quay and Devereux scales combined. In terms of statistical and practical considerations, the 4 Quay subscales by themselves attained the optimal predictive accuracy (65% or 62 out of 95 children correctly identified). (Author)

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(Abstract)

DISCRIMINATORS OF CLINICALLY DEFINED EMOTIONAL MALADJUSTMENT: THE PREDICTIVE VALIDITIES OF THE QUAY AND DEVEREUX SCALES

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INTRODUCTION

In public school operation of programs for emotionally and socially maladjusted children,[9,13] the identification and placement processes raise many problems. In attempts to improve diagnostic procedures, an increasing number of objective personality tests has been the result.[4,5] Screening procedures have evolved that involve the teacher who is with the child under question more than any other school official. How accurate are such teacher rating scales when compared with independently completed clinical diagnoses of disturbance made by psychiatrists? This study addresses the question. The present investigation is unique in that it pits two commonly used screening scales (the Devereux Elementary School Behavior Rating Scale[25] and the

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** Dr. Proger is Coordinator of Evaluation Services for the Intermediate Unit and served as Chief Statistical Consultant for this project. He also serves as Test Review Editor of the Journal of Special Education. Dr. Mann is Director of the grant under which this study was completed. Dr. Mann is also Executive Editor of the Journal of Special Education. Green, Bayuk, and Burger served as research consultants during the conduct of the study

Behavior Problem Checklist [22]) against each other in terms of various validity considerations relative to a common, outside criterion (individual psychiatric diagnoses guided by DSM-II[6]). Most of the existing research on objective personality scales used in school programs considers the characteristics of a single scale in isolation rather than making relative comparisons. [3, 10, 11, 12, 16, 18, 21, 23, 27, 28, 30, 31] Yet without comparative research as in the present study, few guidelines exist for choosing screening devices other than subjective critiques.[4]

PROCEDURE

From a population of about 130 boys between the ages of 8 and 14 who were enrolled in special classes for emotionally disturbed children within the suburban Greater Philadelphia Area, 96 Ss were randomly selected to be participants. In particular, stratified random sampling from the population was used to ensure that 32 Ss were drawn from each of the three diagnostic categories of aggressive, hyperactive, and withdrawn. (However, one S had to be deleted from the hyperative group because of unforeseen difficulties during the experiment.) The original diagnostic classifications in the population had been pre-established in clinical evaluation fashion on the basis of several composite criteria derived from the standard American Psychiatric Association behavioral categories. The three categories were actually condensations of much more detailed diagnoses made in accordance with DSM-II.[6] Collapsing the detailed categories into three primary domains was guided in large part by previous research.[1] The majority of detailed diagnoses were made by fully qualified psychiatrists during December, 1970.*

* The investigators are deeply grateful to Mrs. Nancy Anderson, Assistant Director of Special Education for Intermediate Unit No. 23 in charge of the Learning and Adjustment Programs, and to her psychiatric staff. Without their cooperation, this controlled investigation would not have been possible.

The aggressive group consisted of children who exhibited outer-directed motoric behavior, while the hyperactive group contained youngsters who demonstrated non-directed motoric behavior. The mean age in months for the total sample was 121.3.

The full-scale WISC, IQs were 101.22 (aggressive), 99.38 (hyperactive, and 97.31 withdrawn). The verbal WISC IQ scores were 96.06 (aggressive), 99.28 (hyperactive), and 96.19 (withdrawn), while the performance IQ scores were 106.50 (aggressive), 104.09 (Hyperactive), and 99.00 (withdrawn). Every attempt was made to ensure comparability of CA across diagnostic classifications during samplying from the original population so that differences in IQ across these three groups would appear to be innate representative ones.

The data analyzed in the present study came from the summer, 1971, phase of multiyear research project conducted in a rural summer camp setting north of the suburban Greater Philadelphia Area. * Two rating scale batteries were completed for each S: the 14 subtests of the Devereux Elementary School Behavior Rating Scale[25] and the 4 subtests of the Quay Behavior Problem Checklist.[22] The two batteries were completed by the teachers who were fully aware of their children's behavioral problems; the teacher ratings on the two batteries were completed for the most part between March, 1971, and the end of the school year. Thus, each teacher had more than ample time during the previous months of school to become familiar with each child's peculiarities.

The primary interest of this study was to assess the predictive validities of the subtests in each of the two batteries of scales. Three stepwise discrim-

*The interest of this study was strictly in the measurement relationships between clinically defined behavioral maladjustment and the two "objective" teacher rating scales. However, the multiyear research grant under which this study was completed also sought at a later time to offset some of the socially inappropriate behaviors exhibited by this particular sample of disturbed children, as well as a totally different sample of comparable size (for replication's sake). The results of the remediation efforts are contained in a large document to be available from Educational Resources Information Center (ERIC) and abstracted in a 1974 issue of ERIC's monthly publication, Research in Education.

inant analyses [2, 7, 29] were computed using the BMD07M program from the Health Sciences Computing Facility at UCLA[8]: (a) Quay scales only, (b) Devereux scales only, and (c) Quay and Devereux scales combined. In each of the three analyses, the criterion was the independently completed, clinically defined behavioral status (aggressive, hyperactive, or withdrawn), while the predictors or discriminators were the subtests from the scale(s) under scrutiny. The three discriminant analyses provide one with the basic information needed to assess the diagnostic validity of each separate test battery as a whole, as well as to determine which subtests within each battery do not add significantly to the battery's differential validity.

Besides investigating the differential predictive validities of the Quay and Devereux scales, the study obtained a large amount of descriptive information about the nature of the clinically defined behavioral disturbances. Intercorrelations within and among the 4 Quay subtests and the 14 Devereux subtests were generated, as well as means and standard deviations.

RESULTS AND DISCUSSION

Descriptive Statistics: Because part of the rationale of this study was to shed light on behavioral correlates of independent clinical judgments of disturbance in children, Table 1's results are of considerable interest. Of the 150 coefficients presented, 78 are significantly different from 0.000

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Insert Table 1 about here
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at the .05 level of confidence, where probabilistically only about 8 coefficients should attain such status. Thus, clearly something more than random forces are at work among the behavioral ratings of disturbance derived from the Quay and Devereux scales.

Within the Quay scales, Scale Q-2 (Personality) and Scale Q-3 (Immaturity) are highly related, as are Q-1 (Conduct) and Q-4 (Socialized Delinquency).

Among the Devereux scales, Scale D-1 (Classroom Disturbance) and Scale D-9 (Irrelevant-Responsiveness) are of particular interest. In particular, D-1 correlates highly with D-2 (Impatience), D-3 (Disrespect-Defiance), D-4 (External Blame), and D-9 itself. Apart from D-1, D-9 is also highly correlated with D-2, D-3, and D-4. Thus, D-1 and D-9 appear to operate in a highly similar fashion.

A few other observations can be made about the intercorrelations among the Devereux scales. First, D-3 and D-4 are themselves highly correlated. Second, D-6 (External Reliance) and D-8 (Inattentive-Withdrawn) are closely associated. Third, D-4 and D-13 (Quits) share much in common. Finally, D-8 and D-12 (Unable to Change) are highly related.

Of particular interest is how the Quay and Devereux scales relate to each other apart from their separate internal sets of correlations. One striking finding is that Q-4 (Socialized Delinquency) does not seem to relate to <u>any</u> of the Devereux scales very well. Among the Devereux scales, neither D-10 (Creative Initiative) nor D-11 (Need Closeness to Teacher) relate highly to any of the Quay scales.

The descriptive background data in Table 1 also yields what might be considered norming information for highly specific, clinically defined subpopulations of maladjusted children. One can see clear and distinct differences on several of the variable means, most notably Q-1, Q-4, D-1, D-3, D-4, and D-5. Apparently, teachers are quite valid discerners of clinical differences on disturbed children. Of course, such a finding is hardly stunning in view of past research on teacher ratings in academic areas of functioning.[19, 20]

Predictive Validity: Looking at only the Quay scales, (Table 2) Q-3 (Immaturity) was the best single predictor of diagnostic group membership, but only 41 of 95 children could be correctly identified. Thus Q-4 (Social-

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Insert Table 2 about here
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ized Delinquency) and Q-1 (conduct) had to be added in turn. These 3 scales seem to provide the optimally efficient number of correct group classifications (58 out of 95 or about 61%). Q-2 (Personality) is of questionable utility in this regard. Table 3 provides the two strongest discriminant functions when all 4 Quay scales are included.

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Turning to only the Devereux scales (Table 4), one sees that 5 scales (D-4, D-3, D-1, and D-11) are needed to produce the optionally efficient number of correct group classifications (57 out of 95).

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Table 5 provides the weights from the two strongest discriminant functions when

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all 14 Devereux scales are included. From Table 2 and Table 4, then, one can conclude that there is little difference in practical prediction when one compares 3 of the 4 Quay scales with 5 of the 14 Devereux scales. That is, the predictive accuracy of the optimal, practical number of subtests from either battery is about 60% (57 or 58 out of 95 children). However, the analyses reflected in Table 2 and Table 4 do not tell one what the most effective combination of both Quay and Devereux scales might be. Table 6 reflects this situation.

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From Table 6, one sees that if he would use D-8 (Inattentive-Withdrawn), D-4 (External Blame), Q-4 (Socialized Delinquency), and Q-1 (Conduct, he would achieve a predictive accuracy (60%) comparable to that reflected above in Table 2 and Table 4. However, by adding 5 more subtests for a total of 9, one can increase predictive accuracy from 60% to 68%. Table 7 contains the weights of the two strongest discriminant functions. One should note that this optimal combination of 9 subtests contains all 4 of the Quay subtests.

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Insert Table 7 about here
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Considering from Table 2 that all 4 Quay subtests yield a predictive accuracy of 65% (62 out of 95 children), one would not think it worthwhile to administer 9 selected Quay and Devereux subtests; the Quay battery of 4 scales do as well as any other (greater) combination of subtests. Moreover, from a purely pragmatic viewpoint, the considerably less amount of scoring activities required by the 4 Quay subtests, or the optimal battery of 9 Quay and Devereux subscales, indicates that the Quay battery is more than adequate unto itself to discriminate among three clinically defined, behaviorally disturbed groups of aggressive, hyperactive, and withdrawn children.

Much has been written on the pitfalls of clinical psychiatric diagnostic procedures.[17,24] There are a host of diagnostic classification schemes which lend further confusion to this issue.[15] While one cannot deny the true misclassification dangers inherent in the "professionally made" diagnoses by psychiatrists, it is somewhat refreshing to see in this study the fairly high degree of agreement (ranging from about 60% to about 68%) between independently completed appraisals of the same subjects with behavioral disorders. All cannot be bad in such a situation. It should also be noted here that once

again, contrary to stereotypical opinion, teacher ratings have been shown to possess a high degree of predictive validity when judged on the basis of more refined diagnostic procedures (as used by psychiatrists). [19,20]

Finally, a few precautions and suggestions for further research are in order. First, comparative studies of the relative predictive validities of various screening and diagnostic instruments used in programs for the emotionally disturbed should be encouraged. To be sure, such comparative studies are methodologically difficult to carry out. At the bare minimum, a comparative study needs at least three measures taken on the same subjects: at least two measures (the predictors) which are to be pitted against each other and a third measure (the criterion) done independently of the predictors. A great deal of time, and cooperation is needed on the part of investigators and subjects alike. Second, there is a much bigger type of study than the present one which would shed even more light on the soundness of psychiatric diagnoses. One could employ two comparably large samples of children whereby one sample has been predefined as disturbed and the other sample is presumed normal. The investigator would pit professional psychiatric diagnoses against structured teacher ratings to see how many false hits and misses and true hits and misses result under either method of screening. Clearly, much remains to be done in the area of comparative diagnostic validity studies.

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TABLE 1

INTERCORRELATION MATRIX AND DESCRIPTIVE STATISTICS

Variable Number and Name	Q-1 Con.	Q-2 Per.	Q-3 In.	Q-4 Soc. Del.	Q-1 Class Dist.	Q-2 Imp.	Q-3 Dis. Def.	Q-4 Ext. Bl.	Q-5 Ach. Anx.	Q-6 Ext. Rel.	Q-7 Comp.	Q-8 In. With.	Q-9 Irr. Res.	Q-10 Cre. In.	Q-11 Need	Q-12 Un. Ch.	Q-13 Quits	Q-14 Slow Work
Variable Number	Intercorrelations																	
-2	.133																	
-3	.041	.596																
-4	.098	.152	.303															
-1	.610	.650	.176	.232														
-2	.497	-.043	.134	.147	.621													
-3	.527	.013	.007	.209	.254	.484												
-4	.412	.126	-.010	.060	.557	.422	.611											
-5	.153	.237	-.119	-.140	.067	.085	.174	.436										
-6	.102	.272	.314	-.116	.140	.330	.661	.203	.346									
-7	.041	.020	-.273	.043	-.084	-.137	.007	-.036	.064	-.472								
-8	.019	.367	.493	-.259	.161	.150	.038	.128	.206	.512	-.436							
-9	.559	.147	.174	.153	.617	.488	.495	.560	.261	.321	-.206	.360						
-10	.295	-.061	-.157	.019	.177	.146	.230	.245	.087	-.206	.334	-.307	.281					
-11	-.014	-.143	.018	-.171	.076	.137	-.081	.053	.004	.293	-.041	-.022	.280					
-12	.253	.266	.280	-.079	.265	.201	.232	.345	.265	.400	-.103	.402	.286	-.121	-.011			
-13	.233	.233	.340	.026	.372	.359	.334	.503	.362	.259	-.182	.409	.280	.040	-.097	.468		
-14	.000	.211	.404	.045	.037	.186	-.009	.027	-.062	.207	-.313	.333	.044	-.043	-.044	.272	.419	
Statistic	Descriptive Information																	
$Mean_A$	10.423	6.686	2.631	0.688	15.000	13.969	11.812	13.562	13.500	16.933	12.750	9.969	10.344	12.656	15.062	3.094	4.281	3.406
$S.D._A$	5.193	3.318	1.817	0.903	4.522	4.397	3.737	4.697	5.039	5.483	3.293	4.284	3.365	3.376	4.621	1.467	1.871	2.014
$Mean_H$	7.814	5.419	2.355	1.097	13.258	13.129	11.000	12.742	12.097	16.871	12.645	10.581	10.258	12.645	15.710	2.710	3.903	3.097
$S.D._H$	6.183	3.304	1.854	1.221	4.626	4.380	4.567	5.170	4.833	5.277	2.690	4.048	2.944	3.346	4.613	1.468	1.921	2.150
$Mean_W$	5.931	6.069	4.125	0.219	14.052	12.312	7.656	9.531	11.438	18.406	10.719	16.312	10.812	8.938	13.469	3.750	4.219	4.750
$S.D._W$	4.385	3.922	2.254	0.659	5.193	4.709	3.815	5.346	5.205	5.285	3.709	5.468	4.519	3.546	5.622	1.706	2.018	2.140

Note: Using Fisher's Z_r transformation, one finds that r=.20 or more is needed to have coefficients significantly different from 0.000 in a 2-tail test when N = 95.

TABLE 2

SUMMARY OF DISCRIMINANT ANALYSIS

QUAY SCALE

Step Number	Variable Entered [a]	F Value to Enter [b]	U-Statistic [c]	Number of Children Correctly Identified
1	Q-3 (Immaturity)	7.421	0.861	41
2	Q-4 (Socialized Delinquency)	10.262	0.703	46
3	Q-1 (Conduct)	7.260	0.605	58
4	Q-2 (Personality)	1.042	0.591	62

[a] Numbers refer to Quay factor score names.

[b] The degrees of freedom for the variable entered at Step 1 are 2 and 92. For each step thereafter, the within groups degrees of freedom decrease contineously by 1.

[c] The degrees of freedom at each step are 2 and 92.

TABLE 3

DISCRIMINANT FUNCTION STATISTICS

QUAY SCALE

Variable [a]	Weights	
	First Function [b]	Second Function [c]
Q-1 (Conduct)	-.082	.158
Q-2 (Personality)	-.054	.117
Q-3 (Immaturity)	.480	-.058
Q-4 (Socialized Delinquency)	-.594	-.784

[a] Numbers refer to Quay factor score names.

[b] The canonical correlation is .568 and the cumulative proportion of total dispersion is .766. The group means are -.475 (aggressive), -.494 (hyperactive), and .953 (withdrawn).

[c] The canonical correlation is .356 on the cumulative proportion of total dispersion is 1.000. The group means are .457 (aggressive), -.465 (hyperactive), and -.006 (withdrawn).

TABLE 4

SUMMARY OF DISCRIMINANT ANALYSIS

DEVEREUX SCALE

Step Number	Variable Entered [a]	F Value To Enter [b]	U-Statistic [c]	Number of Children Correctly Identified
1	D-8 (Inattentive-Withdrawn)	18.071	0.718	50
2	D-4 (External Blame)	7.172	0.620	50
3	D-3 (Disrespect-Defiance)	1.058	0.606	50
4	D-1 (Classroom Disturbance)	1.158	0.591	54
5	D-11 (Need Closeness to Teacher)	1.247	0.574	57
6	D-9 (Irrelevant-Responsiveness)	1.279	0.558	52
7	D-5 (Achievement Anxiety)	1.227	0.542	57
8	D-12 (Unable to Change)	1.040	0.530	57
9	D-10 (Creative Initiative)	0.738	0.520	63
10	D-14 (Slow Work)	0.668	0.512	62
11	D-6 (External Reliance)	0.969	0.500	61
12	D-7 (Comprehension)	0.277	0.497	65
13	D-13 (Quits)	0.110	0.496	63
14	D-2 (Impatience)	0.000	0.496	63

[a] Numbers refer to Devereux factor score names

[b] The degrees of freedom for the variable entered at Step 1 are 2 and 92. For each step thereafter, the within groups degrees of freedom decrease continuously by 1.

[c] The degrees of freedom at each step are 2 and 92.

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TABLE 5

DISCRIMINANT FUNCTION STATISTICS

DEVEREUX SCALE

Variable [a]	Weights	
	First Function [b]	Second Function [c]
D-1 (Classroom Disturbance)	.012	.277
D-2 (Impatience)	-.001	.001
D-3 (Disrespect-Defiance)	.100	-.164
D-4 (External Blame)	.063	-.057
D-5 (Achievement Anxiety)	.011	.151
D-6 (External Reliance)	.053	-.056
D-7 (Comprehension)	-.032	-.097
D-8 (Inattentive-Withdrawn)	-.114	-.076
D-9 (Irrelevant-Responsiveness)	-.140	-.136
D-10 (Creative Initiative)	.105	.061
D-11 (Need Closeness to Teacher	.026	-.028
D-12 (Unable to Change)	-.063	.400
D-13 (Quits)	.012	-.137
D-14 (Slow Work)	-.117	.183

[a] Numbers refer to Devereux factor score names.

[b] The canonical correlation is .677 and the cumulative proportion of total dispersion is .671. The group means are .754 (aggressive), .526 (hyperactive), and -1.263 (withdrawn).

[c] The canonical correlation is .292 and the cumulative proportion of total dispersion is 1.000. The group means are .339 (aggressive), -.395 (hyperactive), and .943 (withdrawn).

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TABLE 6

SUMMARY OF DISCRIMINANT ANALYSIS

QUAY AND DEVEREUX SCALES

Step Number	Variable Entered [a]	F Value to Enter [b]	U-Statistic [c]	Number of Children Correctly Identified
1	D-8 (Inattentive-Withdrawn)	18.071	0.718	50
2	D-4 (External Blame)	7.172	0.620	50
3	Q-4 (Socialized Delinquency)	3.282	0.578	52
4	Q-1 (Conduct)	4.495	0.525	57
5	D-3 (Disrespect-Defiance)	2.495	0.497	58
6	D-11 (Need Closeness To Teacher)	1.784	0.477	58
7	D-9 (Irrelevant-Responsiveness)	2.023	0.456	62
8	Q-3 (Immaturity)	1.725	0.438	62
9	Q-2 (Personality)	1.239	0.426	65
10	D-7 (Comprehension)	0.680	0.419	65
11	D-10 (Creative Initiative)	1.033	0.408	67
12	D-12 (Unable to Change	0.476	0.404	67
13	D-6 (External Reliance)	0.564	0.398	68
14	D-14 (Slow Work	0.508	0.393	67
15	D-5 (Achievement Anxiety)	0.322	0.390	67
16	D-1 (Classroom Disturbance)	0.066	0.389	67
17	D-2 (Impatience)	0.048	0.389	67
18	D-13 (Quits)	0.026	0.388	67

[a] Numbers refer to Quay (1 to 4) and Devereux (1 to 14) factor score names.

[b] The degrees of freedom for the variable entered at Step 1 and 2 and 92. For each step thereafter, the within groups degrees of freedom decrease continuously by 1.

[c] The degrees of freedom at each step are 2 and 92.

TABLE 7

DISCRIMINANT FUNCTION STATISTICS

QUAY AND DEVEREUX SCALES

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Variables [a]	Weights	
	First Function [b]	Second Function [c]
Q-1 (Conduct)	.034	.256
Q-2 (Personality)	.075	.068
Q-3 (Immaturity)	-.215	.060
Q-4 (Socialized Delinquency)	.428	-.746
D-1 (Classroom Disturbance)	-.024	.034
D-2 (Impatience)	.014	.000
D-3 (Disrespect-Defiance)	.079	-.226
D-4 (External Blame)	.055	.009
D-5 (Achievement Anxiety)	-.010	.057
D-6 (External Reliance)	.040	-.059
D-7 (Comprehansion)	-.065	-.125
D-8 (Inattentive-Withdrawn)	-.068	-.120
D-9 (Irrelevant-Responsiveness)	-.167	-.072
D-10 (Creative Initiative)	.104	.015
D-11 (Need Closeness to Teacher)	.059	-.017
D-12 (Unable to Change)	-.009	.208
D-13 (Quits)	.029	-.014
D-14 (Slow Work)	-.103	.028

[a] Numbers refer to Quay (1 to 4) and Devereux (1 to 14) factor score names.

[b] The canonical correlation is .711 and the cumulative proportion of total dispersion is .788. The group means are 0.755 (aggressive), 0.659 (hyperactive), and -1.394 (withdrawn).

[c] The canonical correlation is .464 and the cumulative proportion of total dispersion is 1.000. The group means are 0.603 (aggressive), -0.657 (hyperactive) and 0.054 (withdrawn).